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LEPEOPHTHEIRUS FRECUENS NEW SPECIES AND NEW RECORD OF *KROYERINA MERIDIONALIS* RAMIREZ, 1975 AND NEW HOSTS RECORD FOR *LEPEOPHTHEIRUS CHILENSIS* WILSON, 1905 (COPEPODA: SIPHONOSTOMATOIDA) PARASITIC ON FISHES OF CHILE, SOUTH AMERICA

Raúl Castro Romero and Hernán Baeza Kuroki

ABSTRACT

Lepeophtheirus frecuens, a new species of parasitic copepod from *Oplegnathus insignis* (Kner) type host fish and other host fishes of the inshore waters of Antofagasta, Chile, is described and illustrated. The new species is separated from its short abdomen congeners by the first maxilla with the medial tine shorter than the lateral one and by a series of differences in its appendages, particularly the second antenna of the male.

New host species for *Lepeophtheirus chilensis* Wilson, 1905 are named. The range of *Kroyerina meridionalis* Ramirez, 1975 is extended from the Mar del Plata, South Atlantic to the South Pacific coast of Antofagasta, Chile. Some comments about the morphology and morphometric characters of these two species are made.

The parasitic copepods of Chilean fishes are still very poorly known although the coast of Chile extends for over 2,500 miles, from the tropics to the colder regions of temperate latitudes, and provides habitats for a rich and varied fish fauna. So far only eight species of *Lepeophtheirus* Nordmann, 1832 have been recorded from Chile according to Atria, 1977; Baeza and Castro, 1980 and Castro and Baeza, 1981. We are pleased to add to this list a new species and also the first record of *Kroyerina meridionalis* Ramirez, 1975 and new host species for *Lepeophtheirus chilensis* Wilson, 1905 all discovered in the course of a survey in the vicinity of Antofagasta, Chile.

Lepeophtheirus frecuens new species
Figures 1–25

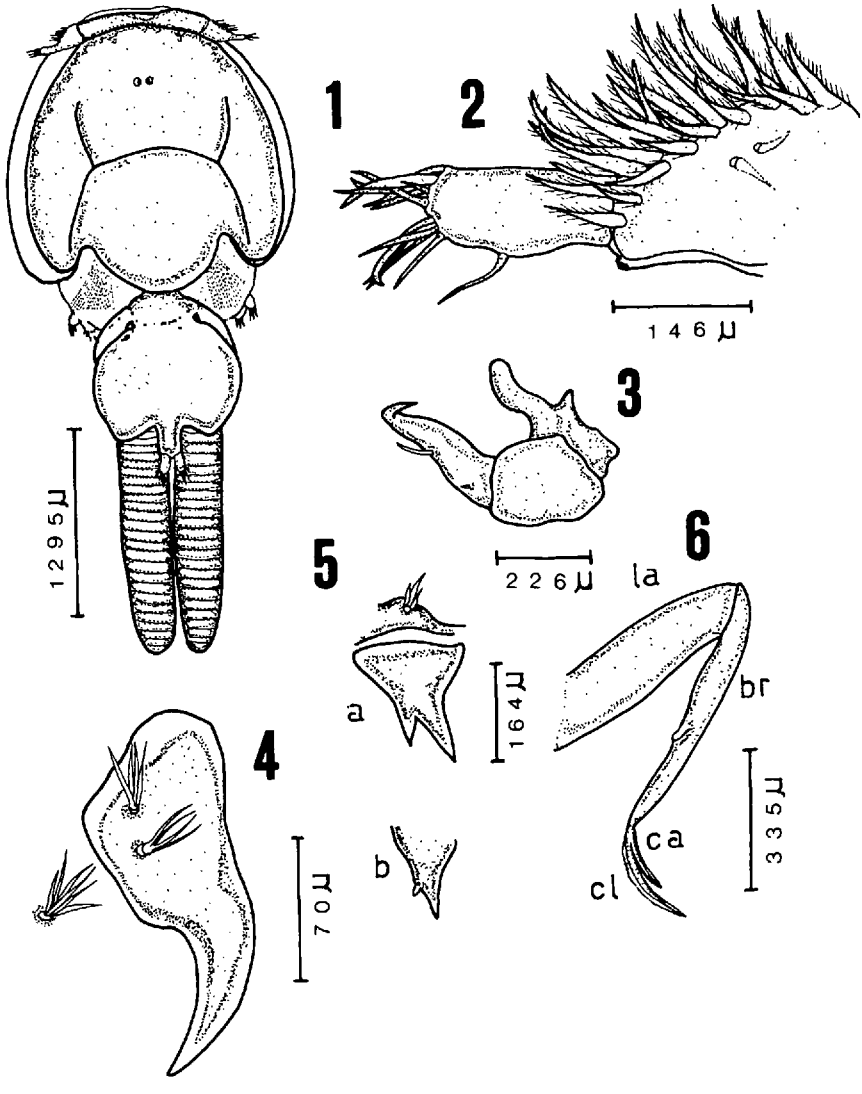
Record of Specimens.—One hundred and eight ovigerous females and 47 males were taken from several fish species in Coloso, Juan López and Isla Santa María, Chile (23°39'S; 70°25'W) from June 1979 to May 1980. Type specimens were deposited in Museo Nacional de Historia Natural de Chile, holotype female Reg. No. MNHN 15045; allotype male Reg. No. MNHN 15047 and 10 paratype females Reg. No. MNHN 15048.

Hosts.—*Oplegnathus insignis* (Kner) type host; *Cheilodactylus variegatus* Valenciennes; *Pimelometopon maculatus* (Perez); *Aplodactylus punctatus* Valenciennes; *Graus nigra* Philippi; *Doydixodon laevifrons* (Tschudi) and *Acanthisthius pictus* (Tschudi).

Habitat.—The specimens were captured from body surfaces of the hosts.

Methods.—The specimens were fixed and preserved in neutralized formalin (8%). The appendages were dissected, cleared and studied as whole mounts in glycerine. Figures were drawn with the aid of a camera lucida. The terminology adopted in the description is based on Kabata (1979).

Differentiation of the specimens from other species follows Kabata (1973), Ho and Dojiri (1977), Castro and Baeza (1981) and is based on appendage structure,

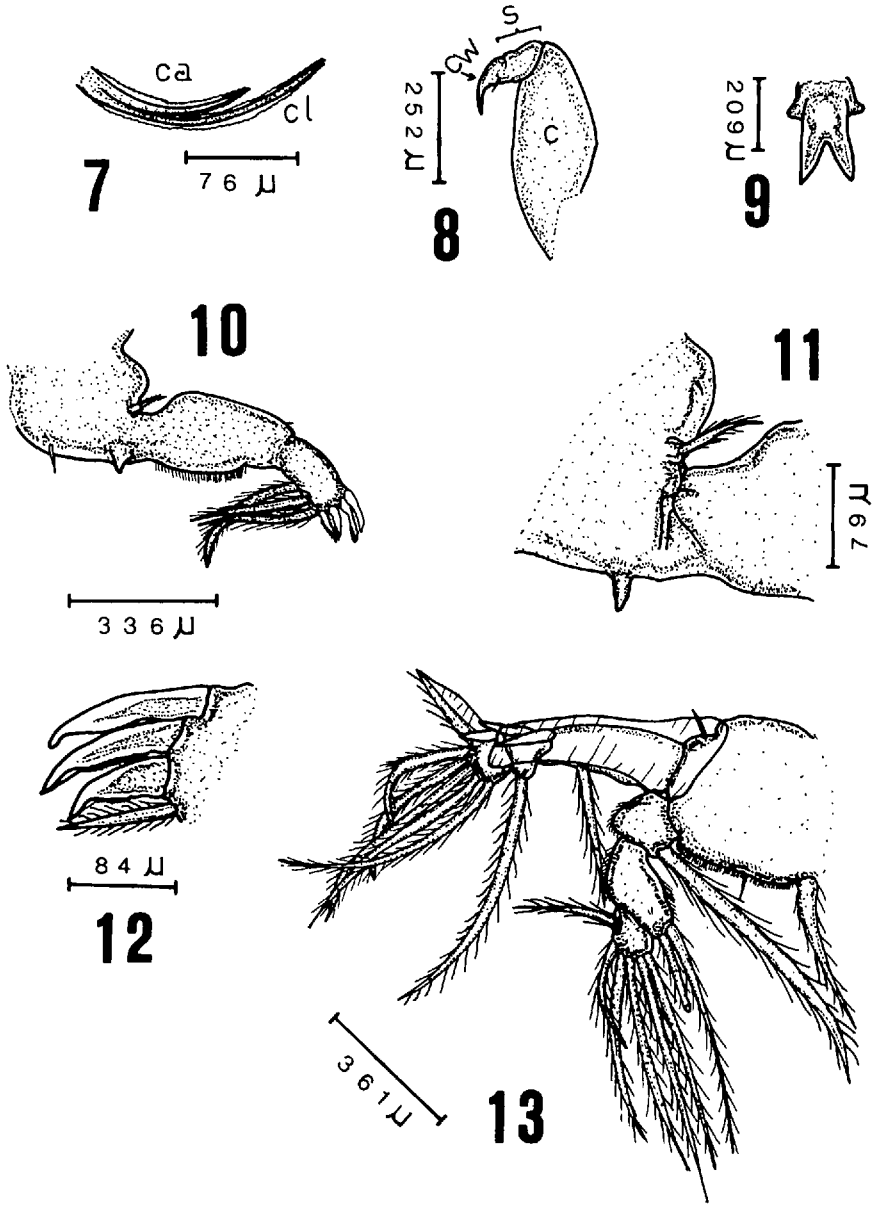


Figures 1–6. *Lepeophtheirus frecuens,* female (1) dorsal view; (2) first antenna; (3) second antenna; (4) postantennal process; (5a) adult female first maxilla; (5b) juvenile female first maxilla; (6) second maxilla (1a = lacertus, br = brachium, cl = clavus, ca = canna).

armature and complemented by cephalic structures which provide corroborative evidence for the specific differentiation.

Description.—FEMALE (Fig. 1). Cephalothorax with subcircular dorsal shield (width 90–97% of length); frontal plates prominent; posterior sinuses shallow, posterior margin of thoracic zone protruding beyond tips of lateral zones. Fourth pedigerous segment articulating with cephalothorax by narrow peduncle, broader than long (width 24–30% of dorsal shield width).

Genital complex slightly shorter than thoracic zone of dorsal shield, subcircular, with re-entrant posterior margin and posterolateral lobes. Abdomen one segmented its length less than half of genital complex.



Figures 7–13. *Lepeophtheirus frecuens*, female: (7) second maxilla, distal end (ca = canna, cl = clavus); (8) maxilliped (c = corpus, s = shaft, cw = claw); (9) sternal furca; (10) first leg, total view; (11) first leg, sympod-exopod joint; (12) first leg exopod, distal armature; (13) second leg, total view.

Dimensions (in mm) based on 17 specimens from type series: Cephalothorax, length 2.10 (range 1.94–2.35); width 2.06 (range 1.94–2.35). Fourth pedigerous segment, length 0.28 (range 0.24–0.36); width 0.53 (range 0.48–0.61). Genital complex, length 0.80 (range 0.71–1.73); width 1.16 (range 1.03–1.33). Abdomen, length 0.35 (range 0.28–0.42); width 0.36 (range 0.30–0.47). Egg sacs, length 1.54 (range 1.27–1.69); diameter 0.34 (range 0.30–0.36). Total length 5.26 (range 4.50–6.56).

First antenna (Fig. 2) usual for *Lepeophtheirus*, two-segmented, with two spiniform processes in posterolateral corner of basal segment. Second antenna (Fig. 3) three segmented, basal segment with short process, medial one more robust than others, without characteristic feature. Distal finishing in strongly curved claw, bearing small seta on basal border and other longer on medial part. Postantennary process (Fig. 4) with robust base, tapering curving shaft about as long as base, basal surface bears two papillae each with four fine hairs and also papilla with six fine hairs.

First maxilla (Fig. 5a) with bifid dentiform process, the medial tine much shorter than lateral [in young females (Fig. 5b) medial tine underdeveloped, represented by short outgrowth].

Second maxilla (Fig. 6) with robust lacertus and slender brachium about equally long, calamus longer than canna (Fig. 7).

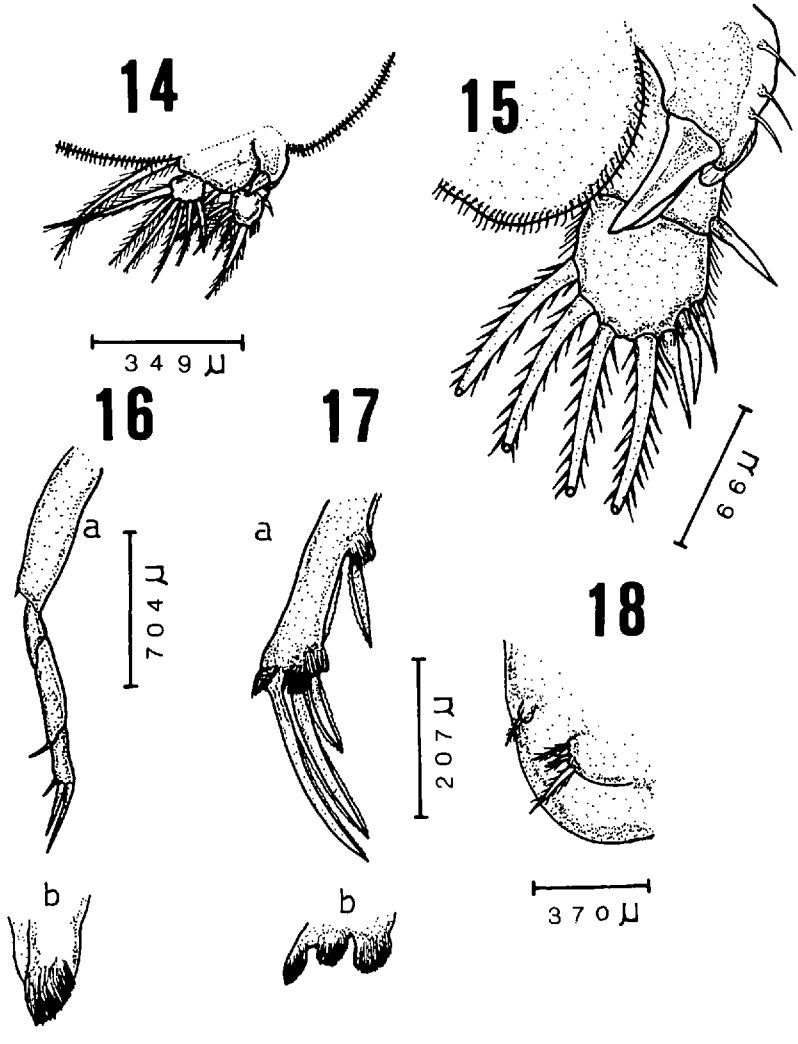
Maxilliped (Fig. 8) with suboval, unarmed corpus; claw of subchela longer than shaft. Sternal furca (Fig. 9) with rectangular box; tines straight, acuminate, outer margins nearly parallel, inner margin divergent.

First leg (Fig. 10) with the characteristic structure of the genus, bearing a stubby endopod; the sympod bearing a pinnate seta surmounted on papilliform outgrowth and proximal fine setule (Fig. 11). Exopod bisegmented, basal one bearing only one small single seta on its distal upper edge. Second one shorter than first, with three plumose setae on ventral margin. The distal margin of second segment (Fig. 12) with single unarmed seta 1, seta 2 and 3 chelate with posterior margins serrated, seta 4 pinnate, seta 2 slightly longer than 1 and 3 about as long as seta 4.

Second leg (Fig. 13) biramous. Endopod trisegmented, with medial segment longer than basal and distal respectively. Basal one armed with long feathered seta on its inner distal edge and fine setules in outer edge, distal one with five feathered setae on distal edge and one on outer edge. Exopod trisegmented, basal one almost twice length of other two. This segment armed with one spine on outer distal edge, that spread to edge of second segment and one feathered seta on inner edge; bears fine membranous fringe. Second one armed similarly to anterior. Distal one bears five long feathered setae on distal edge and presence of one spine in basal part of outer edge and one seta with its inner edge feathered and outer provided with fine membranous fringe.

Third leg (Fig. 14) biramous. Protopod very expanded, with entire margin fringed by strip of fine setules. Both ramis reduced in size. Exopod trisegmented, basal segment shorter than other two, armed with one feathered seta on distal inner edge; from base of this segment arise process (basal process) that has distal outer flange and distally strong spine softly curved (Fig. 15). Second one almost same size as distal, armed with one long feathered seta on distal inner edge and one short naked seta on distal outer edge. Distal one bears four feathered setae on distal end and single short setae on distal outer edge. Second and third segment bear fringe of fine setules on outer edge. Endopod bisegmented, basal largely extended and covering partly first and second segment of endopod (in ventral view); basal armed with one feathered seta on inner edge. Distal segment with six feathered setae on distal edge and with fine setules on outer edge.

Fourth leg (Fig. 16a) with three-segmented exopod, middle segment longer than other two, armed with distal spine. Basal segment with dentiform spinule and pecten in distolateral corner (Fig. 16b). Distal segment with three setae, all with two marginal narrow strips of serrate membranes and pectens on base (Fig. 17b). Second seta slightly shorter than first but about twice as long as third (Fig. 17a). Second and third segment with narrow strip serrated membrane on external margin.



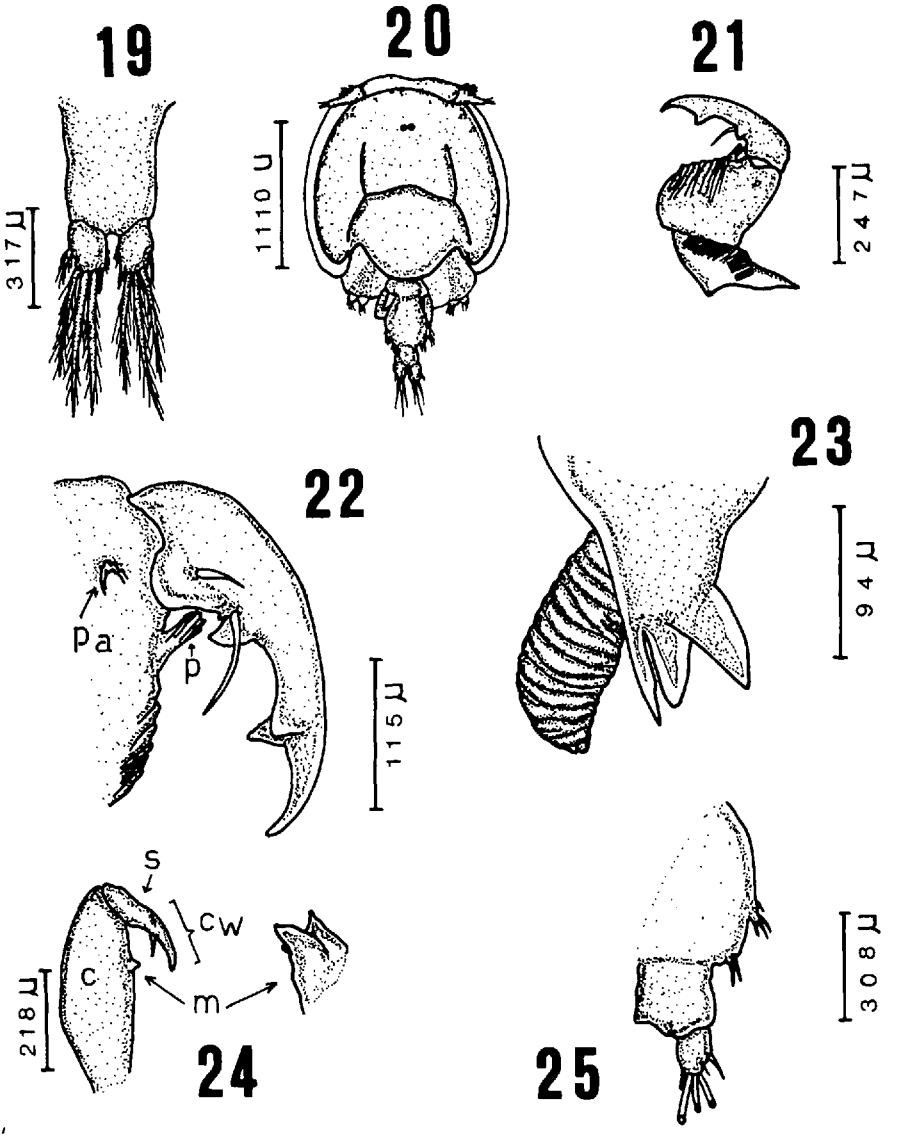
Figures 14–18. *Lepeophtheirus frecuens*, female: (14) third leg, partial view of the protopod and ventral rami; (15) third leg, detail of the exopod and basal spine; (16a) fourth leg exopod; (16b) basal segment, detail of the spine and pecten; (17a) detail of the armature of the distal segment of the fourth exopod; (17b) detail of the distal armature of the basal pecten; (18) fifth leg, its position on the distolateral corner of the genital complex.

Fifth leg (Fig. 18) transversely suboval, with three pinnate setae on lateral margin and papilla with pinnate seta located above this more laterally.

Uropod (Fig. 19) subquadrangular, about half length of abdomen, with abundant tuft of setae on medial margin.

MALE (Fig. 20). Cephalothorax similar to female. Fourth pedigerous segment wider than long, indistinctly delimited from genital complex. Latter suboval, about ½ length of thoracic zone of cephalothorax. Abdomen one-segmented (Fig. 25) about 0.5 of genital complex. Uropods (Fig. 25) similar to those of female.

Dimensions (in mm): Cephalothorax, length 1.50 (range 1.45–1.57); width 1.38 (range 1.27–1.51). Fourth pedigerous segment, length 0.18 (range 0.15–0.23); width 0.37 (range 0.23–0.42). Genital complex, length 0.44 (range 0.38–0.47);



Figures 19–25. *Lepeophtheirus frecuens:* (19) female: abdomen, uropods and armature; (20–25) *L. frecuens* male: (20) dorsal view of male; (21) second antenna; (22) detail of the distal part of the second antenna (pa = pad-like structure, p = protruding pad); (23) first maxilla and adhesion pad; (24) maxilliped (c = corpus, s = shaft, cw = claw, m = myxal area); (25) position of the fifth and the sixth leg on the distolateral border of the genital complex, abdomen and one uropod.

width 0.39 (range 0.36–0.42). Abdomen, length 0.20 (range 0.19–0.26); width 0.20 (range 0.11–0.23). Uropods, length 0.15 (range 0.13–0.17); width 0.09 (range 0.07–0.11). Total length 2.47 (range 2.30–2.70).

Second antenna (Fig. 21) with longitudinal adhesion pad on proximal segment, pad ½ width of segment; second segment inflated, with large, transverse adhesion pad; smaller, protruding pad (Fig. 22p) ending in several laminae and another

pad-like structure (Fig. 22pa) near distal border; claw (Fig. 22) with dentiform and tubercular outgrowth on distal half, one large and one small denticle, and two setae on proximal half. First maxilla (Fig. 23) medial tine slightly shorter than lateral; medial process about as long as tine. Adhesion pad nearly as long as dentiform process (Fig. 23).

Maxilliped (Fig. 24) resembling that of female but with subconical protuberance on medial margin and three dentiform outgrowths on protuberance. Sternal furca, first, second and fourth leg as in female. Fifth leg (Fig. 25) papilliform on lateral margin of genital complex; papilla surmounted by three pinnate setae; another seta on margin of complex near base of papilla. Sixth leg (Fig. 25) in posterolateral corner of genital complex, papilliform, bearing two pinnate setae and another one shorter, above these.

Etymology.—The specific name *frecuens,* Latin meaning frequency, refers to the frequency of the parasites on the host species at the different localities surveyed.

Discussion.—The purpose of the study was to establish the identity of the specimens. They were compared with the short abdomen congeners (less than 0.5 of the length of the genital complex) and the first maxilla with the medial tine shorter than the lateral one, discarding all those that did not possess these characters. Among these species that are similar to the species studied are: *L. nanaimoensis* Wilson, 1905; *L. parviventris* Wilson, 1905; *L. pravipes* Wilson, 1912; *L. breviventris* Fraser, 1920; *L. sekii* Yamaguti, 1936; *L. plectropomi* Nunes-Ruivo et Fermanoir, 1956; *L. epinepheli* Ho and Dojiri, 1977; *L. argentus* Hewitt, 1962; *L. distinctus* Hewitt, 1963; *L. paulus* Cressey, 1969; *L. kabatai* Ju Shey Ho and Dojiri, 1977; *L. zbigniewi* Castro and Baeza, 1981.

From this group *L. breviventris, L. distinctus, L. epinepheli, L. kabatai, L. paulus, L. plectropomi, L. pravipes* and *L. sekii* are different from the new species by the first leg (distal armature of the exopod), third leg (basal process of the exopod) and fourth leg; in *L. frecuens,* the distal armature of the first leg has the medial seta longer than the other two contiguous and by a series of differences in other appendages and structure which corroborate this separation. *L. breviventris* differs from *L. frecuens* in the postantennal process and sternal furca; *L. distinctus* differs in the sternal furca; *L. kabatai* differs in the fifth leg; *L. paulus* differs in the postantennal process, sternal furca and the fifth leg; *L. plectropomi* differs in the sternal furca and the postantennal process; *L. pravipes* differs in the postantennal process and *L. sekii* differs in the postantennal process, sternal furca and the fifth leg.

Among other species *L. argentus* and *L. nanaimoensis* differ from the new species by the third, fourth and fifth leg, corroborating these differences with *L. argentus* by the postantennal process and the sternal furca. *L. zbigniewi* is different from *L. frecuens* in the first leg (morphologic character sympod-exopod joint), third leg (basal process of the exopod) and the fifth leg.

The differences in the structure and the armature of the thoracic appendages (first, third, fourth and fifth legs) are sufficient to distinguish the specimens in this study from their congeners (which share some characters in common). These differences are complemented by some cephalic appendages that represent corroborative evidence in the separation of the species.

The new species is also characterized by the form of the terminal claw and the protruding pad (on its medial segment) on the second antenna of the male, making it different from the other species. These combinations of characters of *L. frecuens* justify the creation of a new taxon.

Lepeophtheirus chilensis Wilson, 1905

Lepeophtheirus chilensis Wilson, 1905, pp. 658–661, Lam. 28, figs. 353–364.

Record of Specimens.—4 females (1 ovigerous) from *Cheilodactylus variegatus* (Val); 2 ovigerous females from *Doydixodon laevifrons* (Tschudi) and 5 ovigerous females from *Pimelometopon maculatus* (Perez) all of them from the body surface of the host fishes, collected in Antofagasta in June 1979. This material was deposited in the authors' collection.

Dimensions (in mm) of the specimens. (Hosts: A, *Cheilodactylus variegatus*; B, *Pimelometopon maculatus* and C, *Doydixodon laevifrons*).

Hosts	A	B	C
Total length	4.8	5.3	4.8
Cephalothorax length	2.5	2.8	2.7
Cephalothorax width	2.3	2.5	2.4
Fourth pedigerous segment length	0.4	0.3	0.3
Fourth pedigerous segment width	0.8	0.8	0.9
Genital complex length	1.3	1.4	1.2
Genital complex width	1.7	1.7	1.5
Abdomen length	0.3	0.5	0.4
Abdomen width	0.3	0.3	0.3
Uropod length	0.1	0.1	0.1
Uropod width	0.1	0.1	0.1
Egg sac length	1.7	2.4	2.1
Egg sac width	0.3	0.3	0.3

Discussion.—All the morphological characters of the specimens studied are similar to the description and illustration given by Wilson 1905 and with the details added subsequently by Stuardo and Fagetti, 1961.

Previous Records.—Wilson (1905) recorded *L. chilensis* parasitic on *Sebastes* sp. and on a "ray," type locality Lota (Chile). Further Stuardo and Fagetti (1961) reported the species from *Sebastodes oculatus; Sebastodes prognathus* and *Graus nigra,* locality Valparaíso, Chile. The host species of genus *Sebastodes* were transferred to *Sebastes capensis* Gmelin, 1788 (Kong, 1980). This paper adds to the list of host species *Pimelometopon maculatus, Cheilodactylus variegatus* and *Doydixodon laevifrons,* all from inshore water. This also extends the distributional range from the Central region to the Northern region of the Pacific coast of Chile.

Kroyerina meridionalis Ramirez, 1975

Kroyerina meridionalis Ramirez, 1975, pp. 37–41.

Record of Specimens.—3 ovigerous females and 1 young female from the branchial plates of *Callorhynchus callorhynchus.*

Locality.—Juan López, Chile (23°29'S; 70°28'W), on September 1980. This material was deposited in the authors' collection. Dimensions (in mm) based on 3 specimens: Cephalon, length 0.74 (range 0.72–0.76); width 0.72 (range 0.72–0.74). Second thoracic segment, length 0.17 (range 0.15–0.19); width 0.57 (range 0.55–0.58). Third thoracic segment, length 0.21 (range 0.19–0.24); width 0.50 (range 0.49–0.53). Fourth thoracic segment, length 0.26 (range 0.24–0.28); width 0.44 (range 0.41–0.49). Trunk, length 6.16 (range 5.96–6.90); width 0.42 (range 0.36–0.48). Abdomen, length 0.35 (range 0.31–0.39); width 0.17 (range 0.15–0.19). Uropods, length 0.14 (range 0.12–0.15); width 0.39 (range 0.38–0.41). Egg sac, length 3.00 (range 2.60–3.27); width 0.18 (range 0.18–0.18). Total length 7.96 (range 7.22–8.88) from the end of the head to the distal edge of the uropod.

Discussion.—The size of the specimens captured in Antofagasta is almost the same as the paratype examined with the length/width relation of the trunk a little less (mean 14.8) respect to the same relation of the paratype (mean 18). The length/width relation of the uropod (astas furcales, Ramirez, 1975) is 3.5 for the Antofagasta specimens in concordance with the paratype.

Morphologically the specimens captured on *Callorhynchus callorhynchus* in Antofagasta are identical to the original description, is only necessary to add the presence of spinulation on all laterodorsal and lateroventral margins of the genital complex (fifth thoracic and genital somite, Ramirez, 1975) and the presence of one small seta on the basal third of the maxilliped claw and other one of major size on the medial region of the same structure (details not quoted in the original description).

Briefly, the *Kroyerina meridionalis* specimens captured in Antofagasta, on the same host as the original description agree with the size, morphologic and morphometric characters.

Distribution.—This species was collected in the coastal zone of the Mar del Plata, South Atlantic (37° LS; 58° LW). This extends the distributional range to the Chilean coast, South Pacific, on the same host.

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ADDRESS: *Instituto de Investigaciones Oceanológicas, Universidad de Antofagasta, Casilla 1240. Antofagasta, Chile.*